

I. Project Title: Channel Monitoring to Evaluate Geomorphic Changes on the Mainstem Colorado River

II. Principal Investigator:
John Pitlick, Ph.D.
Department of Geography University of Colorado
Campus P.O. Box 260, Boulder, CO 80309-0260
E-mail: pitlick@spot.colorado.edu
Phone: (303) 492-5906

III. Project Summary:

The project is designed to develop a better understanding of sediment transport and channel dynamics in the upper Colorado River to evaluate rates of channel change and geomorphic effects of coordinated reservoir releases and normal snowmelt flows. The study will identify the window of time of peak sediment delivery to the 15-Mile Reach. The study will also compare and contrast effects of augmenting flows on the ascending and descending limbs of the annual hydrograph. Detailed surveys of channel topography were conducted along a 1-km section of the 15-Mile Reach. Sediment traps, consisting of large tin cans filled with clean gravel, were placed at three sites in the 15-Mile Reach and at two sites in the 18-Mile Reach. Cross sections at the mouths of secondary channels and backwaters, that were first surveyed 5 years ago, were re-located and re-surveyed. The study will culminate in the development of a matrix, which can be used by the Coordinated Reservoir Operations group to tailor reservoir operation to target multiple objectives of habitat maintenance and creation.

IV. Study Schedule: Initial Year - 1998, Final Year - 2002

V. Relationship to RIPRAP: Colorado River Action Plan: Mainstem I.A.c.(3)(c)
Coordinated Reservoirs Operations.

VI. Accomplishments of FY 2001 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

2001 was the fourth year of this project. Field work again focused on effects of spring and summer flows on geomorphic processes in the 15- and 18-mile reaches of the Colorado River. Tasks completed during the 2001 field season are described as follows:

(a) Measurements to assess sediment transport and channel change were continued in the 1-km study reach near river mile (RM) 176. Prior to spring runoff, rectangular patches of gravel were painted with brightly colored spray paint to determine the extent of bed material motion at various places across a large bar. Particles were painted without physically removing them from the bed. The patches were precisely located and photographed, then relocated and photographed after the peak flow. Water-surface

elevations were measured at 11 individual cross sections near the peak of the 2001 hydrograph. These data will be used to further refine models of flow and boundary shear stress in the reach. These same cross sections were re-surveyed at low flow (July) to evaluate patterns of scour and fill since 1998, when they were first measured.

(b) Six cross sections near RM 134 (location of the state line gage) were re-located and surveyed. These sections were first measured in 1994, thus the repeat survey gives an indication of longer-term scour and fill.

(c) Cross sections across four separate backwaters were re-surveyed.

(d) Sediment traps consisting of large tin cans filled with clean gravel were periodically cleaned and replaced. These traps are being used to monitor the movement and infiltration of fine sand and silt after the peak discharge. The traps were cleaned at intervals ranging from several days to two weeks. Sediment size analysis is ongoing.

Discussion of Initial Findings:

(a) Projections of a thin snowpack and low runoff in early May precluded the use of bypass flows to elevate peak flows in the 15 mile reach. Provisional data from USGS streamflow gages indicate that mean daily discharges reached a peak of 9180 cfs (260 cms) at Cameo on 6/03/01. Daily flows at the Palisade gage reached a peak of 8410 cfs (238 cms) on 5/21/01, whereas daily flows at the state line gage reached a peak of 13,000 cfs (368 cms) on 5/18/01. These are the lowest peak flows of the 4-year study period. Field evidence from the site near RM 176, and many other areas, indicated that these flows were too low to move very much of the gravel bed material, except in a few localized areas. Nearly all of the painted rocks on the gravel bar at RM 176 remained in place, in spite of being submerged by 1 meter of water for several weeks. More obvious was the growth of vegetation on low-lying bars: most gravel bars in the 15- and 18-mile reaches are now covered with a relatively dense mixture of willow, tamarisk, and cottonwood seedlings. These seedlings were present the year before, but their survival and continued growth indicate that peak flows did not disturb the substrate on any widespread basis.

(b) Surveys of the backwater cross sections reveal minor amounts of scour and fill in response to peak flows in 2001.

(c) The sediment traps were cleaned several times on the receding limb of the hydrograph (from early June through July). Sampling over relatively short time intervals again revealed that fine sediment can fill the void spaces in the traps in only a few days, although this depends on the specific location of the trap. There also appears to be a transition in the size of sediment collected; sediment collected in the week or two following the peak is much coarser than that collected later on. The transition in sediment size presumably represents a change in transport mode, from sand moving as bed load to silt moving as suspended load.

VII. Recommendations:

The findings of this work should be shared with the Coordinated Reservoirs team as soon as any definitive results are identified and documented. The effort the Colorado River Water conservation District is currently contracting for should be coordinated with this Project. Principal Investigator meets with the CROP team periodically to share results .

VIII. Project Status: The primary end products of this project will be a report, which will be available in draft form by June 1, 2002. This report will serve as the source data for development of a matrix which will relate flows to the physical characteristics of the river needed to support habitat for endangered fish. The matrix will consist of 5 or 6 different categories of flows intended to achieve specific purposes including channel maintenance and habitat improvements. Much of the information needed to develop the flow matrix is complete, and work will continue over the next 6 months to finalize specific technical aspects and flow recommendations.

IX. FY 2000 Budget Status:

A. Funds provided: \$ 23,900
B. Funds expended: \$ 23,900
C. Difference: 0

X. Status of Data Submission: Cross section and sediment data will be made available to the Recovery Program library in June 2001.

XI. Signed: George Smith, for John Pitlick January 11, 2002.
Principal Investigator Date